

**Operating Instructions
for
Paddle System Flow
Transmitter for Liquids**

Model: DWD



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2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.

The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EWG-machine guidelines.

PED 97/23/EG for DWD-1 and DWD-2

In acc. with Article 3 Paragraph (3), "Sound Engineering Practice", of the PED 97/23/EC.

Diagram 8, Pipe, Group 1 dangerous fluids

3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.

Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

Scope of delivery:

The standard delivery includes:

- Paddle System Flow Transmitter for Liquids model: DWD
- 2 fold magnets
- Operating Instructions

4. Regulation Use

The Paddle System Flow Transmitter for Liquids, model DWD, is used for monitoring and measuring of liquid flows. Only low viscous and homogenous media may be measured, which do not affect the materials used in the instrument. Dirt particles and fates could slog on the paddle and provide alarm signal and measurement errors.

5. Operating Principle

The flowing medium presses against a baffle plate that is fastened to a spring loaded fulcrum. The paddle movement causes displacement of the fulcrum. The position of a magnet attached to the fulcrum changes and is sensed by a Hall-effect sensor inside the meter head, isolated from the liquid. This signal is processed and evaluated by a microchip - based electronics with EEPROM memory. The digital display indicates the actual flow or totalised value and the analogue output changes its signal proportional to actual flow. Two adjustable switching relays for flow set-point monitoring can be adjusted with front buttons. An RS-232-C serial interface is available as an option.

6. Mechanical Connection

6.1 Mounting position

It is advantageous to install the unit in a straight piece of pipe and to choose a place of mounting which has the biggest possible distance from elbows, valves etc. It is especially important to have the biggest possible distance from magnet valves and ball valves. Please make sure that they are opened as slow as possible, especially if the pipe after the valve is empty. These measures prevent the measuring system from flow shocks which can cause damages. We recommend a straight length of $10 \times d$ at input side and $5 \times d$ at the output side (d = diameter of pipe). The apparatus provides a stable signal when installed at closer distances, but depending on flow conditions it may be less accurate

6.2 Mounting position on electronic view

Please take in consideration that the mounting has to be done EMI conform in order to avoid interruptions of operations.

Especially the following points have to be attended:

- The provided ferrites have to be mounted as described.
- Signal and supply cable of the DWD may not directly taken close to 230 V or 380 V wirings.
- The device should not be installed close to inductance, switching loads, engines or similar sources of inductive fields.

6.3 Flow direction

It is essential that the unit is mounted so that flow is as indicated by the arrow on the body. The unit will not operate unless installed correctly in this way and the possibility of damage to the unit cannot be excluded.

6.4 Mounting position



Make sure that the supply wires are de-energized.

If the position of display or housing needs to be changed, it can be done on site. In order to do this, the front and rear covers of the housing should be removed. The PCB plate can be rotated, after loosening the screws of the PCB cage. Rotate in 90° steps and re-fasten. Similarly the window of the electronic front cover can be rotated. Shall the housing be turned, first the circuit board must be taken out and the hexagon fastening nut must be unscrewed. After detaching the housing it can be turned.



Please ensure that the PC board and the cable connection do not get damaged.

6.5 Mounting in pipe

Units with THREADED CONNECTION

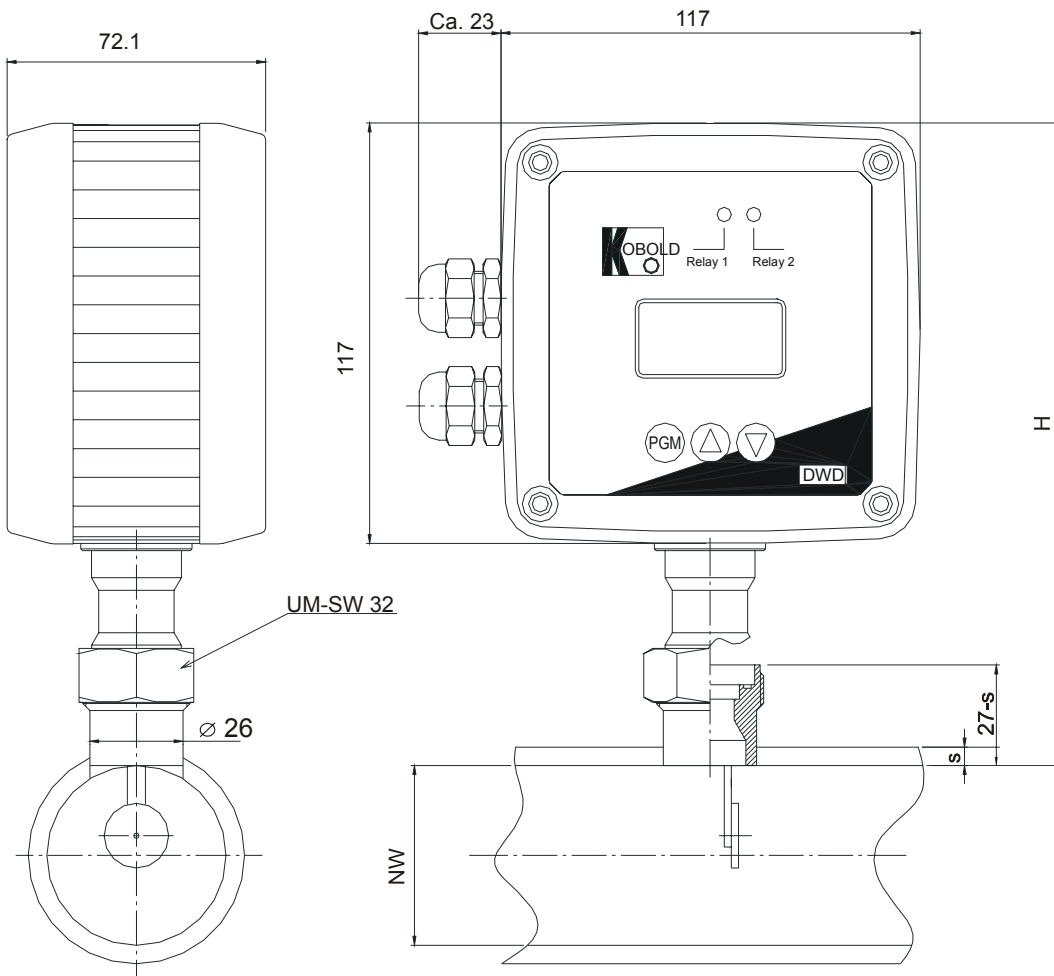
As sealing, PTFE tape is recommended. Take care that the unit does not get damaged while screwing in. In addition, no residue of sealing tape or other dirt should remain in the pipe.

Units with FLANGED CONNECTION

Suitable flange sealing is to be used. This, as well as mounting screws, is not included in delivery scope. Take care that the unit does not get damaged during installation.

Units with WELD-ON SLEEVE

The weld-on sleeve is part of delivery scope. It must be removed from the unit by loosening the union nut. The mentioned drawing dimensions (welding-insertion-length) must be taken in consideration (27mm-S) (S = pipe wall thickness). A bore free of burrs must be drilled into the pipe. Subsequently the sleeve has to be welded on and the unit has to be attached. Please ensure that the meter movement does not get damaged during mounting. During welding of the sleeve, the flow direction must be kept in mind (groove in the flowing against side). Opposite of the groove is a paddle limiter, which should not be damaged or removed during the mounting procedure.



7. Electrical Connection

7.1 General

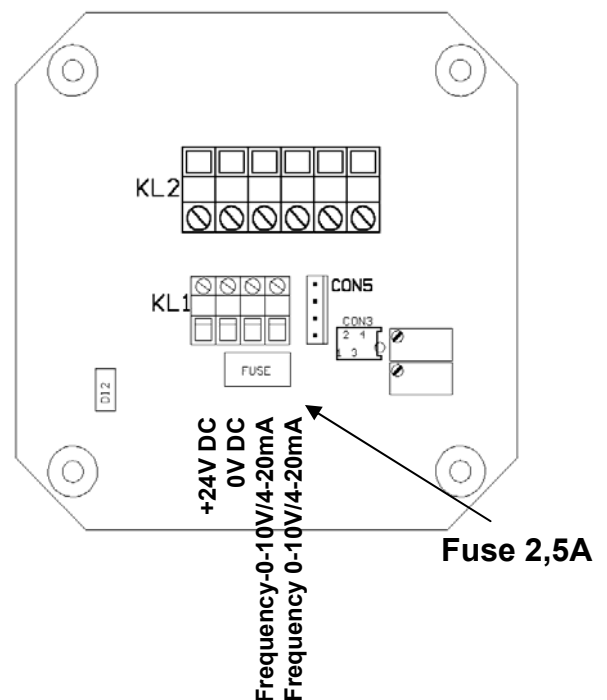


Make sure that the supply wires are de-energized.

After removal of the back cover, the terminal blocks can be accessed (see the following drawing).

The terminal connectors of KL2 are for connecting the relays, the terminal connectors of KL1 are for connecting power supply and output signals.

Prior to wiring the terminal blocks, all the cables must be pulled through the corresponding cable gland on the instrument housing.



7.2 Power supply

The required supply voltage is $24 V_{DC} \pm 10\%$.

The power supply connection is at KL1.

Connect according to the previous drawing (see chapter 7.1 General): $+24V_{DC}$ (+) and $0 V_{DC}$ (-).

In order to prevent the electronic from impermissible potential between pipe and device, the power supply device must be connected to a grounded power system. If the leads are switched, the fuse must be changed.



Attention! A supplied ferrite with a coil must be mounted at the connection cable for magnetic field protection.

7.3 Analogue output

The connection is at terminal strip KL1.

Connect according to drawing chapter 7.1 General:

-0-10V/4-20 mA

+0-10V/4-20 mA

The maximum load is 500 Ω .

A supplied ferrite with a coil must be mounted at the connection cable for magnetic field protection.

7.4 Voltage output (0-10 V)

Connection is to block KL 1 according to the drawing. (See reference point 8.4). At the connection cable a ferrite must be fixed. The ferrite is included in delivery.

7.5 Frequency output

Connection is to block KL 1 according to the drawing. (See reference point 8.4). At the connection cable a ferrite must be fixed. The ferrite is included in delivery.

7.6 Connecting the relays

The switching contacts can be connected at KL2. For wiring diagram please refer to the drawing. A supplied ferrite with a coil must be mounted at the connection cable for magnetic field protection.

7.7 Interface

As special option, the DWD is also available with an interface RS232C. The provided serial cable will be connected to the PC board via a plug. A supplied ferrite with a coil must be mounted at the connection cable for magnetic field protection.



Please note with this option the comments and chapter 8.9 Programming the interface.

8. Commissioning

8.1 Programming the device

The device is equipped with 3 buttons on the front cover. The PGM button is to select a menu point and to set the adjusted values. With the buttons \uparrow and \downarrow values of each parameter can be adjusted. Button \uparrow raises value. Button \downarrow decreases the value. Pressing this button one time changes the value by one digit. If you keep the buttons on hold, the value changes continuously. After some time, speed increases. At some points of the menu, the DWD informs you which buttons have to be pressed as next step. For example *PIN [+/-]*, whereby + corresponds to button \uparrow and – to button \downarrow . The device returns back automatically after some time to the run mode set under *DWD MODE* (see chapter 8.3 Adjusting of standard indication mode), if no button is pressed. In the first line, the menu point is always shown and in the second line, the adjusted parameter value is shown.

8.2 Function BATT CHECK

This function ensures that in case of power failure, dates of the totaliser are still available. Therefore, this function should always be switched on in case of using the totaliser (ON). For more information please see chapter 8.7 The totaliser.

If the totaliser is not used, it is recommended to switch off this function (OFF), because in case of interruption of power, the DWD only works properly after resetting the unit.

With button PGM, the menu is selected and with \uparrow or \downarrow , the function is to be set. Pressing of PGM after adjusting the parameter sets the function.

8.3 Adjusting the switching contacts

Press button PGM until RELAIS 1 appears. Line 2 shows the actual switch point. By pressing \uparrow or \downarrow , the value of the switch point can be adjusted. For setting the switch point, PGM has to be pressed and “*” appears. After some time, the star disappears. Adjusting the switch point is now completed. Pressing button PGM once more results in RELAIS 2 appearing.

Adjustment is as described under RELAIS 1.

When the adjusted value is reached, a lamp is illuminating for control. The green lamp (A) is assigned to RELAIS 1, the red lamp to RELAIS 2 (B).

8.4 Adjusting of the output

The DWD is equipped with a current and a voltage output. The outputs can only be used alternatively. Only one pair of connectors is available for both functions. Connection is to clamp block KL1 (see chapter 7.2 Power supply and 7.3 Analogue output respectively drawing of the board). At menu OUTPUT, analogue or voltage output can be activated. With the buttons \uparrow and \downarrow , the function will be selected.

Button PGM sets the adjustment. At the option frequency output the max. frequency can be adjusted between 125-32000 Hz. Therefore button P must be pressed after entering the frequency function. Then the max. frequency can be adjusted with the buttons \uparrow and \downarrow . Now the adjusted max. frequency corresponds to the upper range value.

Allocation measuring value - output

Measuring value	Output 4-20 mA	Output 0-10 V
0 L/min	4 mA	0 V
ME	20 mA	10 V

Initial of the measuring range at 4-20 mA

The initial of the measuring range of the Paddle System Flow Transmitter for Liquids DWD does not start at zero. At a measuring range of e.g. 10 – 100 L/min, the output is 4 mA between 0 and 9,99 L/min. From 10 L/min the analogue output increases linear from 5,6 mA to 20 mA at 100 L/min.

The analogue value at the initial of the measuring range calculates as follows:

$$MA = D/D_{EW} \times 16 + 4$$

MA = mA value at the initial of the measuring range

D = flow (initial value)

D_{EW} = flow (final value)

Initial of the measuring range at 0-10 V

The initial of the measuring range of the Paddle System Flow Transmitter for Liquids DWD does not start at zero. At a measuring range of e.g. 10 – 100 L/min the output is 0 mA between 0 and 9,99 L/min. From 10 L/min, the analogue output increases linear from 1 V to 10 V at 100 L/min.

The analogue value at the initial of the measuring range calculates as follows:

$$VW = D/D_{EW} \times 10$$

VW = volt value at the initial of the measuring range

D = flow (initial value)

D_{EW} = flow (final value)

8.5 Adjusting of standard indication mode

It is possible to choose between 2 different indication modes. At the point in the menu DWD MODE, you can select the modes. In the second line, the valid mode is shown. FLOW means indication of instantaneous flowrate. TOTAL means that the value of totaliser (total accumulated flow) is shown. You can choose the required indication by using button \uparrow or \downarrow . Button PGM sets the adjustment. Only the selected standard indication is permanently visible. During programming the display will revert back to the standard indication after some time of inactivity during programming.

8.6 Adjusting of response time

The DWD Paddle System Flow Transmitter for Liquids makes 18870 measurements per minute. If the result of each measurement was shown on the display, the indication would change continuously and it would be very difficult to read the erratic indication. Therefore, it is possible to program a gate time between 0 and 3,4s. Then the average value of the values measured within the programmed time is shown. A long gate time causes a slowly changing indication which is easy to read. We recommend to maintain the standard adjustment of 1s. For changing the integration time you can choose the desired time with help of the buttons \uparrow and \downarrow in menu INT.[s]. Button PGM sets the adjustment.

8.7 The totaliser

The device is equipped with a totaliser that displays the total accumulated flow over time. (Menu point *TOT: X.*) X corresponds to the respective quantity. The unit results from flow rate units. (for example l/min corresponds to l). Pressing button \uparrow pushes the memory down to zero.

PRESS <+> to reset appears (+ = \uparrow). Now press \uparrow and hold for approximately 20 seconds. After this time, the total display is reset.

In case of power failure, the totalised value will be stored in memory. If voltage is back again, the device notifies *POWER LOW / PRESS P & \uparrow* respectively *PRESS P & \uparrow* . After pressing PGM and \uparrow (at same time), the DWD changes back to standard mode. After that, the device starts counting from the amount that was present at the time of power failure. This guarantees that the operator is aware that power supply was interrupted, and so the amount indicated perhaps does not correspond to the actual total.



Attention! The power failure supervising function only works if at menu point the function is activated (ON) (see chapter 8.2 Function BATT CHECK).

The device has an 8 digit display, so that a big capacity is available. Depending on the flow, units and time of flow may be quite different. If the maximum

indication value is reached, DWD starts with zero again. At the totaliser menu, you see the actual value immediately after switching over to the totaliser function. That means, when the totaliser menu is selected, the indication is always updated. The actual value is only indicated if the totaliser is defined as standard indication. (The display is on.)

8.8 Restriction of access by code number

In order to restrict access of unauthorised persons to the programming menu, it is possible to activate a code number. At menu point *PIN [+/-]*, it is possible to adjust any code number between 1 and 999 by means of the buttons \uparrow and \downarrow . By pressing PGM and \uparrow at the same time, the programmed code number is activated. *ENABLE* appears on the display. That means that the function is active. If an adjustment in any menu should be changed, the operator is always asked for the code number. The number can be entered as described above. After that *PIN OK!* appears. Now the adjustment can be changed. If *PIN NOT OK!* appears, input was wrong. You now can repeat entering the code number.



Attention! If the number is forgotten, the adjustments cannot be changed.

At menu point *PIN [+/-]* restriction of access can be switched off. Therefore, the code number has to be entered as described above. *PIN OK!* and thereafter *DISABLE* appears.

8.9 Programming the interface

Under menu point "*DWD ADR:*", the address of each device can be programmed (selection by \downarrow , input by PGM). For more details, please see our data sheet for devices with interface. It is only added to devices which are equipped with this option (also see chapter 7.7 Interface).

8.10 Mounting the ferrite

The KOBOLD Paddle System Flow Transmitter for Liquids DWD is EMI certified and comes up to the corresponding norm. The EMI directive will only be achieved, if the provided ferrites are mounted as mentioned under 7.2 Power supply, 7.3 Analogue output, 7.4 Voltage output (0-10 V) and 7.5 Frequency output . If not, serious malfunctions can appear depending on the mounting position.
(q.v. 1.2)



IMPORTANT! Always mount the ferrite !

8.11 Protection on data loss

If your device is operated on incorrect EMI conditions, it could come to data loss respectively damages of coded data in extreme cases.

As the item need these data for a correct function there hereby is an anticipate protection.

In this case the item is showing *K DATA MISSING*.

So that this information is available for the occupant, even in case of a use of the analogue-voltage or frequency output, impermissible values will normally be transferred. These are 1mA, 20V, respectively 0 Hz.

In order to re-establish the function of the item in such a case, the necessary software is saved additionally for safety reasons. The software can be load again with the menu item *FACTORY RESET*. Therefore push the button \uparrow or \downarrow in the menu *FACTORY RESET*. You will be asked to start the action (Y) button \uparrow or to break up (N) button \downarrow .



ATTENTION! When starting the application, all adjusted data as switch points, totalisator value etc. will be lost (Reset to the original factory setting).

Please consider this and keep the data in mind before starting the procedure. After the reestablishment has been started, you will get informed about the status of the procedure. When the flow indication on the display appears, the operation is over. The device is working as usual again. Please consider that for instance the switch points have to be newly installed again.

We would like to point out that the data loss occurs only if the item is used under forbidden conditions. Therefore it is really necessary to open corresponding arrangements in order to avoid a new data loss.

This could be: mounting the provided ferrites, installation of the device at another position, changing the cabling within the installation (no measure or feed lines of the transmitter near high voltage feed cable). Reducing of radiation or magnetic field or even the installation of suitable electrostatic shields.

9. Technical Information

Turndown ratio:	1 : 10 standard (for example: 10-100 l/min)
Accuracy:	+/- 1.5 % FS
Medium temperature:	-20 ... +120 °C (other on request)
Max. pressure:	25 bar (DWD-x5..., DWD-x6..) 16 bar (DWD-x7) (other on request)
Flow:	direction of arrow
Mounting position:	any
Analogue output:	4 – 20 mA; max. load 500 Ω or 0 – 10 V / frequency output
Relay output:	2 change-over contacts(max. 230 V; 1 A) fully adjustable
Display:	LCD DOT-Matrix-module 2 x 8 digits (illuminated)
Power supply:	24 V _{DC} +/- 10 %
Current:	max. 200 mA
Fuse	2,5 A
Protection:	IP 65
Interface (optional):	RS 232C

10. Order Codes

(Example: DWD-15 R10 3 R T 0)

We require the following details as well as the order number:
medium, viscosity, service temperature, operating pressure, flow range within the values below the ration min/max 1:10

Paddle System Flow Transmitter for Liquids model DWD-1.. with thread connection

Flow range (l/min)		Material combination (pendulum system/ T piece)			Connection	Supply	Direction of flow	Location of indicator	Option
min. Water	max. Water	St. steel/ Brass	St. steel/ St. steel	St. steel/ PVC					
1	25	DWD-15..	DWD-16..	DWD-17..	R10= G 3/8* N10= 3/8 NPT*	3= 24 V _{DC}	R= from right to left L= from left to right	T= above lead	0= without 7= RS232C interface
1	55	DWD-15..	DWD-16..	DWD-17..	R15= G 1/2* N15= 1/2 NPT*				
5	100	DWD-15..	DWD-16..	DWD-17..	R20= G 3/4* N20= 3/4 NPT*				
6	150	DWD-15..	DWD-16..	DWD-17..	R25= G 1* N25= 1 NPT*				
10	250	DWD-15..	DWD-16..	DWD-17..	R32= G 1 1/4* N32= 1 1/4 NPT*				
20	400	DWD-15..	DWD-16..	DWD-17..	R40= G 1 1/2* N40= 1 1/2 NPT*				
50	600	DWD-15..	DWD-16..	DWD-17..	R50= G 2* N50= 2 NPT*				
							T= from top to bottom B= from bottom to top	R= right of lead L= left of lead	

*Model DWD-15... female thread to R40, above external thread; Model Typ DWD-16.../DWD-17... female thread to R40, above external thread

Paddle System Flow Transmitter for Liquids model DWD-2.. with flange connection

Flow range (l/min)		Material combination (pendulum system/ T piece)			Connection	Supply	Direction of flow	Location of indicator	Option
min. Water	max. Water	St. steel/ Brass	St. steel/ St. steel	St. steel/ PVC					
1	25	DWD-25..	DWD-16..	-	F10= DN 10 A10= 3/8" ANSI	3= 24 V _{DC}	R= from right to left L= from left to right	T= above lead	0= without 7= RS232C interface
1	55	DWD-25..	DWD-16..	-	F15= DN 15 A15= 1/2" ANSI				
5	100	DWD-25..	DWD-16..	-	F20= DN 20 A20= 3/4" ANSI				
6	150	DWD-25..	DWD-16..	DWD-17..	F25= DN 25 A25= 1" ANSI				
10	250	DWD-25..	DWD-16..	DWD-17..	F32= DN 32 A32= 1 1/4" ANSI				
20	400	DWD-25..	DWD-16..	DWD-17..	F40= DN 40 A40= 1 1/2" ANSI				
50	600	DWD-25..	DWD-16..	DWD-17..	F50= DN 50 A50= 2" ANSI				
							T= from top to bottom B= from bottom to top	R= right of lead L= left of lead	

Baffle plate system-flow transmitter DWD-35../ DWD-36.. with weld-on part, DWD-37.. with boring pipe box

Flow range (m ³ /h)		Material combination (pendulum system/ weld-on part)			For pipe cross-section	Supply	Direction of flow	Location of indicator	Option		
min. Water	max. Water	St. steel/ St. steel	St. steel/ St. steel	St. steel/ PVC							
1.2	24	DWD-35..	DWD-36..	DWD-37..	W40= DN 40	3= 24 V _{DC}	R= from right to left L= from left to right	T= above lead	0= without 7= RS232C interface		
3.0	36	DWD-35..	DWD-36..	DWD-37..	W50= DN 50						
4.8	60	DWD-35..	DWD-36..	DWD-37..	W65= DN 65						
7.2	90	DWD-35..	DWD-36..	DWD-37..	W80= DN 80						
12	144	DWD-35..	DWD-36..	DWD-37..	W1H= DN 100						
18	225	DWD-35..	DWD-36..	DWD-37..	W1Z= DN 125						
24	330	DWD-35..	DWD-36..	DWD-37..	W1F= DN 150						
42	600	DWD-35..	DWD-36..	DWD-37..	W2H= DN 200						
72	900	DWD-35..	DWD-36..	-	W2F= DN 250						
102	1200	DWD-35..	DWD-36..	-	W3H= DN 300						
150	1800	DWD-35..	DWD-36..	-	W3F= DN 350						
180	2400	DWD-35..	DWD-36..	-	W4H= DN 400						
300	3600	DWD-35..	DWD-36..	-	W5H= DN 500						
							T= from top to bottom B= from bottom to top	R= right of lead L= left of lead			

11. Maintenance

The DWD is essentially maintenance-free. However, depending on the degree of pollution in the medium, it is recommended that the paddle movement is being inspected and cleaned from time to time, if necessary.

Under no circumstances attempt to remove the paddle from the body, as this will destroy the calibration.



Maintenance work may only be carried out when all electrical lines are currentless and the pipes are emptied and depressurised.



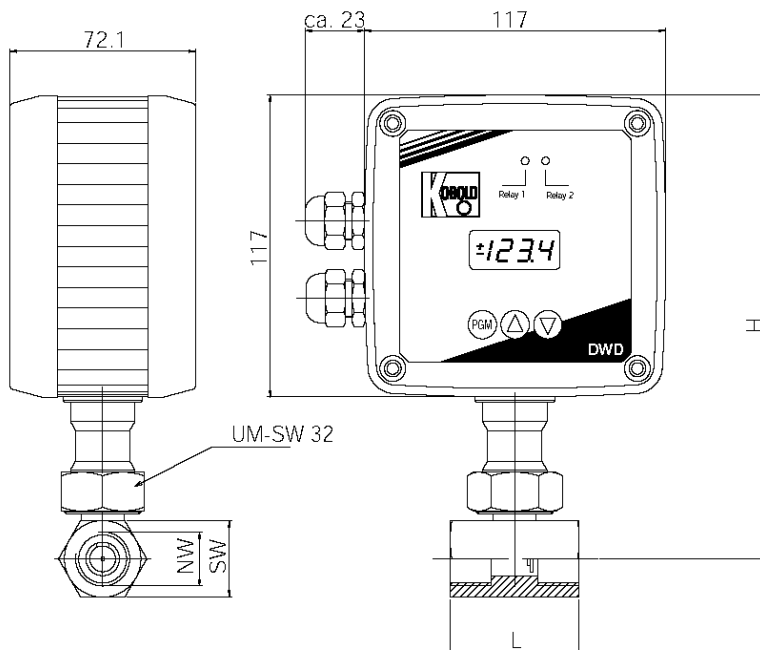
Attention! To separate the instrument from the T-piece, unscrew the union nut and tilt the unit as much as possible to direction of flow. Then lift the DWD with paddle out of the fitting. Please perform all operations with great care to avoid damage especially to the paddle .

12. Dimensions

DWD-15.. up to 1 1/2" with female thread connection

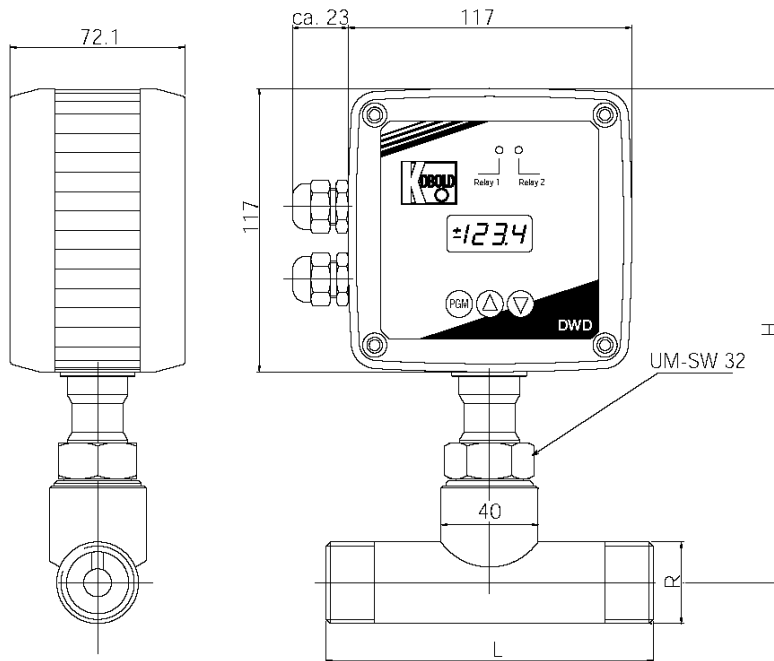
DWD-16.. and DWD-17.. up to 3/4" with female thread connection

Values in () are valid for DWD-16...
Values for DWD-17... on request



NW	L (mm)	H (mm)
3/8"	50	180
1/2"	50	180
3/4"	50	180
1"	50	185 (201)
1 1/4"	50	190 (201)
1 1/2"	50	194 (201)

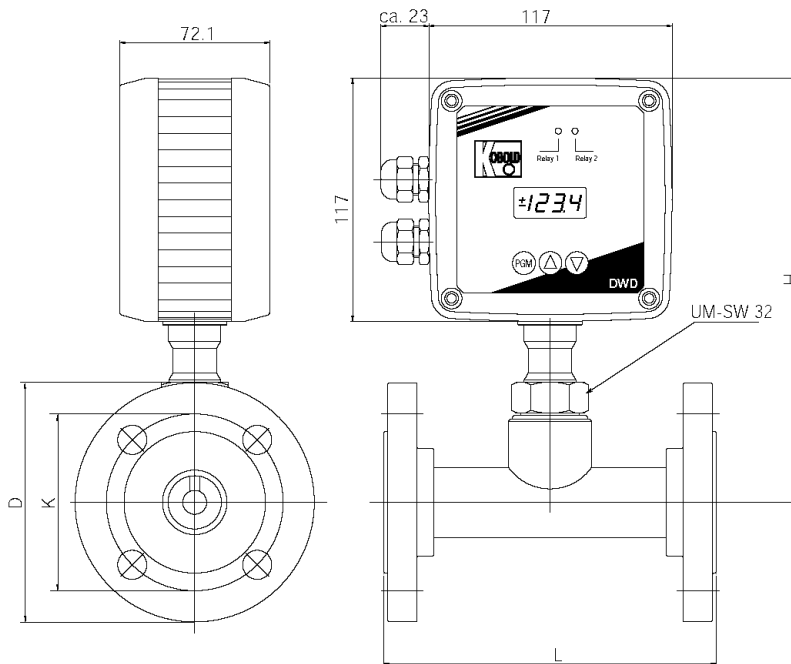
DWD-15.. from 2" with male thread connection
DWD-16.. and DWD-17 from 1" with male thread connection



Values in () are valid for DWD-16...
 Values for DWD-17... on request

NW	L (mm)	H (mm)
1"	135	185 (201)
1 1/4"	170	190 (201)
1 1/2"	170	194 (201)
2"	170	202 (211)

DWD-2.. with flange connection

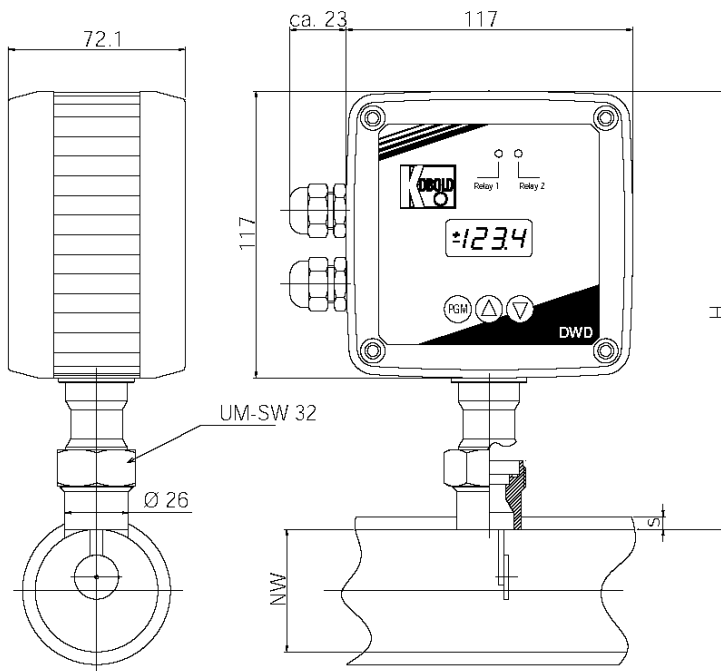


Values in () are valid for DWD-26...

Values for DWD-27... on request

DN	DL (mm)	K (mm)	L (mm)	H (mm)
10	90	60	155	180
15	95	65	155	180
20	105	75	160	180
25	115	85	160	185 (201)
32	140	100	190	190 (201)
40	150	110	190	194 (201)
50	165	125	190	202 (211)

DWD-3.. with weld-on connection



Values are valid for DWD-35... and DWD-36...
 Values for DWD-37... on request

NW	H (mm)
from DN 40	180

13. Declaration of Conformance

We, M/s KOBOLD Messring GmbH, Hofheim-Ts. Germany, declare under our sole responsibility, that this Product:

Paddle System Flow Transmitter for Liquids Model: DWD-...

which relates to this certificate, conforms to the standards listed below:

EN 55011 1991

EN 50082-2 1995

DIN EN 61010 Part 1 1994

following the provision of European Directives:

2004/108/EC
2006/95/EC

Hofheim, 30 Sept. 2002



H. Peters
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M. Wenzel
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